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ABSTRACT

Presented is a report of findings of a 1990 National Health Interview Survey on Assistive Devices which indicated that about 5.3 percent of the American population are using assistive technology to accommodate physical impairments. Background information defines "assistive technology," describe uses, and reviews recent federal legislative and policy initiatives in this area. The interview protocol is described in some detail. Findings are reported for: (1) prevalence of assistive technology devices and home accessibility features (e.g., about 13 million Americans use assistive devices and 7.1 million live in homes adapted for persons with impairments; (2) age patterns (52 percent of users are over 65 years of age); (3) prevalence rates in the general population (1 percent of persons under 25 and nearly 35 percent of persons over 75 years of age); (4) source of payment (48 percent said self or family paid for the devices); (5) unmet needs (2.5 million persons appear to have unmet needs for assistive technology devices; (6) poverty (people with low family incomes are more likely to use such devices); and trends (use of these devices increased faster than did the population even when data is adjusted for an aging population). Seven tables detail the findings. (DB)

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Assistive Technology Devices and Home Accessibility Features: Prevalence, Payment, Need, and Trends

by Mitchell P. LaPlante, Ph.D., University of California, San Francisco, Gerry E. Hendershot, Ph.D., and Abigail J. Moss, Division of Health Interview Statistics

In 1990, more than 13.1 million Americans, about 5.3 percent of the population, were using assistive technology devices to accommodate physical impairments. In 1990, 7.1 million persons, nearly 3 percent of all Americans, lived in homes that were specially adapted to accommodate impairments. About half of the persons with assistive technology devices, and more than three-fourths of those with home accessibility features, purchased them themselves or with the help of their families without contributions from third-party payers. More than 2.5 million Americans said they need assistive technology devices that they do not have, mostly because they cannot afford them. Between 1980 and 1990, the number of persons using anatomical or mobility assistive technology devices increased at a more rapid rate than did the general population.

These findings are from the 1990 National Health Interview Survey on Assistive Devices (NHIS-AD), which was cosponsored by the National Center for Health Statistics (NCHS) and the National Institute for Disability and Rehabilitation Research (NIDRR). NCHS is one of the Centers for Disease Control in the Public Health Service, Department of Health and Human Services. NIDRR is an agency in the Office of Special Education and Rehabilitation Services, Department of Education. NCHS and NIDRR jointly planned the Survey, and the Bureau of the Census conducted the field work.

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Background

"Assistive technology" consists of devices and other solutions that assist people with deficits in physical, mental, or emotional functioning. Assistive technology devices are items frequently used by people with functional deficits as alternative ways of performing actions, tasks, and activities.

Hundreds of assistive technology devices are available. Mobility aids, such as wheelchairs and walkers, orthotics, and prostheses, are more visible and familiar types of assistive technology devices. Some other devices include microcomputers, powered mobility devices, myoelectrically powered prostheses, augmentative communication devices, optical pointers, headsticks, mouthsticks, and alphabet boards. Some assistive devices, such as myoelectrically powered prostheses and infrared hearing systems, are technically sophisticated. However, many devices are "low-tech," such as walkers and canes.

Assistive technology also includes ways of controlling these devices. Software may control ordinary hardware systems in ways that facilitate their use by persons with functional deficits, like text-to-speech conversion software that runs on ordinary computers. Some assistive technology involves extending the range of users. For example, signs with words can be made more legible to everyone, not just persons with vision impairments, by avoiding ambiguity and providing better contrast between letters and background.

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Another way to help people with deficits in physical, mental, and emotional functioning is to build or modify the environment to be more accessible. Accessibility often involves accommodating assistive technology in the design or reconfiguration of features of buildings and environments so they are more useable by people with functional deficits. Accessible design includes reducing barriers in transportation systems, buildings and homes, and recreational and public areas to make them more convenient for people with functional deficits. Some facilitating design features are ramps and approaches, specially configured door openers and locks, wheelchair-lifting devices, and elevating devices.

Assistive technology devices and accessible design are interdependent. A person who uses a wheelchair cannot get into buildings accessible only by stairs. A shopping mall directory may be out of view or meaningless to a person with functional deficits. Barrier-free universal design is increasingly encouraged to allow all persons, disabled or not, to move freely, independently, and safely in their surroundings. Assistive technology devices and accessible environmental design features help people regain function, assist them in performing activities and roles, and can often prevent further disability or reduce the level of disability.

Recent public policies emphasize the societal desirability of access to assistive technology and accessible environmental design. The Americans with Disabilities Act (ADA), enacted on July 26, 1990, and now being implemented, requires employers, public officials, and businesses to make accommodations for people with functional deficits, if such accommodations do not cause undue economic hardship (1). Such accommodations include special training, flexible work schedules, personal assistants, accessible design, and assistive technology devices.

Public Law 100–407, the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (the "Tech Act"), authorizes Federal funds to States that plan and develop consumer-responsive statewide programs of technology-related assistance for individuals with functional deficits or disabilities. This goal can be achieved by providing assistive technology devices and services, by developing an information dissemination system, by establishing or enhancing training and technical assistance, and by designing public awareness projects. Important factors determining the use of technology are benefits and costs of acquiring and using technology. An underlying assumption is that many people who could use technology do not have access to it. The Tech Act recognizes the need for concerted planning to increase access to technology for people with functional deficits.

These recent developments in public policy emphasize the significant contribution of assistive technology for people with disabilities, and the need for national statistics on the use of that technology. In response to that need, NIDRR and NCHS cosponsored a survey on assistive technology devices and homes with accessibility features as part of the National Health Interview Survey of 1990. This is the first report of the results of that survey. The survey focused on assistive technology devices and did not attempt to cover all aspects of assistive technology. For the first time, an NCHS survey included questions about accessibility features in homes. Even people who are not disabled and who live in homes with accessibility features are benefitted because relatives, friends, and others who are disabled can live with them or visit them. Also, these homes will be more practical for their owners, should they develop a functional deficit.

This report provides national estimates of the number of people using assistive technology devices or living in homes with accessibility features in 1990, the types of devices and features used, the sources of payment for this technology, and the number of persons who need but do not have assistive technology devices. Estimates are presented for the total noninsitutionalized population of all ages, and for broad age groups. Statistics on the number of people using assistive technology devices at all ages were last obtained by the NHIS in 1980. This report updates these statistics collected earlier and shows trends over time for comparable items.

Concepts and measures

The Assistive Devices interview began with this preamble: "The next questions are about the use of devices to help people with physical disabilities or impairments." The interviewer then asked, "Does anyone in the family NOW use a brace of any kind? Who is this? Does anyone else now use a brace?" Similar sets of questions were asked about specific devices for mobility, hearing, vision, and speech. The last question in each set (such as mobility) asked if anyone used any other device for that purpose, and a final question asked if anyone used any other special equipment designed for persons with disabilities or impairments. Every device used by any person in the family was recorded.

Any device or equipment reported in response to these questions is considered an "assistive technology device" (except that implanted devices, such as pacemakers, were excluded when mentioned). Some of the devices are "high technology," such as computers, and some are "low technology," such as canes and walking sticks. Other terms sometimes used to refer to assistive technology are "assistive devices," "adaptive technology," "tools and equipment," "aids and appliances," and "special aids." "Assistive technology" is now the most widely used term and is preferred by disability-related organizations. The operational definition of assistive technology used here is consistent with the definition given by DeWitt: "In general, assistive technology includes devices that enhance the ability of an individual with a disability to engage

in major life activities, actions, and tasks" (2).

Although the intention of the Assistive Devices interview was to identify assistive technology used by persons with impairments that are permanent or long lasting, some of the devices may have been used only temporarily during recovery from an injury or acute illness. This would have occurred most often with devices such as crutches, canes, walkers, and wheelchairs, and not at all with some other devices, such as artificial limbs. The number of persons who have acute conditions for which they use devices is unknown, but is assumed to be small compared with the number of people with long-lasting impairments who use devices. Nevertheless, numbers shown in this report probably overestimate slightly the number of chronically ill or impaired persons using any device and of people using some specific devices, such as crutches.

The interviewer also said to the respondent, "Please tell me if this home is equipped with any special features designed for disabled persons," and handed the respondent a printed card listing ramps; extra-wide doors or passages; elevators or stairlifts (not counting public elevators); hand rails or grab bars (other than normal hand rails or stairs); raised toilets; levers, push bars, or special knobs on doors; lowered counters; slip-resistant floors; and other special features designed for disabled persons. The presence of any of these features in the home is considered a "home accessibility feature."

The statistics on home accessibility features refer to persons living in homes with these features, not to those homes. Persons living in homes with accessibility features do not necessarily have an impairment, and, in fact, a majority are reported not to be limited in their activity by an impairment or chronic illness. Even if none of the residents has an impairment, they still benefit from the accessibility features: They are better able to accommodate visitors with impairments, and they are prepared should injury or illness cause an impairment to themselves.

The terms "impairment," "disability," and "handicap" are often used loosely and interchangeably. Where greater precision is needed they must be differentiated and defined. The International Classification of Impairments, Disabilities, and Handicaps (ICIDH) (3) differentiates the terms and defines them as follows: "impairment" is "any loss or abnormality of psychological, physiological, or anatomical structure or function"; "disability" is a restriction in the ability to perform "essential components of everyday living," such as personal hygiene or moving about; "handicap" is a limitation on "the fulfillment of a role that is normal for that individual." A "handicap" is a consequence of a disability, and a "disability" is a consequence of an impairment; however, impairments do not necessarily lead to disabilities, nor do disabilities necessarily lead to handicaps. Furthermore, handicaps and disabilities are not necessarily permanent.

Persons using assistive technology may be assumed to have an impairment, that is, some loss or abnormality of structure or function at the level of organ systems, but it is not known if they have a disability or a handicap. The use of assistive technology devices or home accessibility features may enable them to perform essential functions of everyday living, thus preventing a disability; or it may enable them to perform their normal roles, preventing a handicap. This report describes persons with impairments who use assistive technology devices or home accessibility features to prevent or alleviate disabilities and handicaps.

The prevalence of assistive technology devices and home accessibility features

The estimated numbers of persons in the U.S. civilian noninstitutionalized population who use assistive technology devices are shown in table 1. Altogether, more than 13 million Americans use assistive technology devices. More people use assistive technology devices to compensate for mobility impairments than for any other general type of impairment: 6.4 million use some kind of mobility technology, and 4.4 million use a cane or walking stick, the single most-used assistive technology devices. Other prevalent assistive technologies are hearing aids (3.8 million), walkers (1.7 million), wheelchairs (1.4 million), and back braces (1.2 million).

About 7.1 million people live in homes that have special equipment for persons with impairments. The most common home adaptation is hand rails (3.4 million), followed by ramps (2.1 million), extra-wide doors (1.7 million), and raised toilets (1.3 million).

Age patterns

The percent distribution of persons who use assistive technology devices by age, according to the type of technology used is shown in table 2. Among persons who use any assistive technology devices, the majority (52 percent) are over 65 years of age, reflecting the higher prevalence of impairments in that population. However, for some specific assistive technologies, a significant proportion of users are under age 25 years: foot braces (38 percent), artificial arms or hands (35 percent), adapted typewriters or computers (25 percent), and leg braces (24 percent).

The percent of persons who use assistive technology devices by type of technology used, according to age, is shown in table 3. This emphasizes some of the age differences noted in table 2. For example, in table 3 the proportion of users of devices that use anatomical technology declines significantly and regularly with increasing age, from 62 percent among users under 25 years of age to only 7 percent among users 75 years and over. Mobility and hearing technologies show the opposite trend:

The proportions increase regularly with age, from lows of 23 percent (mobility) and 15 percent (hearing) among persons under 25 years to highs of 67 percent (mobility) and 40 percent (hearing) among persons 75 years and over.

These age-related patterns are also shown for the specific assistive technologies listed, although there are some reversals. For example, the proportion of users who use crutches goes down with age, not up as in the general mobility category. This may reflect the temporary use of crutches by younger persons recovering from injuries to the legs or feet, which are more common among younger people than older people.

Prevalence rates in the general population

The prevalence of assistive devices is described in another way in table 4. Whereas tables 1–3 include only persons who use some kind of assistive technology device or home adaptation, table 4 includes all persons, whether or not they use assistive technology devices, and shows the users as a percent of the total population, according to age. Overall, 5.3 percent of the civilian noninstitutionalized population uses some kind of assistive technology devices or home adaptation. That percent increases with age, from about 1 percent among persons under 25 years of age to nearly 35 percent among persons 75 years of age and over.

Source of payment

Where an assistive technology device or accessibility was used in a sample household, respondents were asked to identify every source of payment for each device or feature from a printed list of sources. The listed sources were: no payment, gift, self or family, private health insurance, Medicare, Medicaid, rehabilitation program, employer, school system, Veterans' Administration program, other private source, and other public source. More than one source of payment could be identified for each technology or feature.

Percent distributions of persons with assistive technology devices or home accessibility features by the sources of payment, according to age, are shown in table 5. About 8 percent of these persons indicated "no payment" or "gift" when asked the source of payment for assistive devices; for about one-third of people with accessibility features in the home, no one paid for those features. Neither of these groups is included in the percent distribution in table 5. The "out-of-pocket" category includes persons who gave only "self or family" as the source of payment. The "third party" category includes persons who named only other sources of payment, including some not on the printed list, and unknown sources of payment. The "combination" category includes persons who named both "self or family" and other sources of payment.

Nearly half (48 percent) the people with assistive technology devices said they or their families paid for them with no assistance from third parties. More than three-fourths of persons with home accessibility features said they were paid for entirely by themselves or by their family. Third-party sources made complete or partial payment for more than half of users' assistive technology devices (52 percent), and for about one-fourth of users' home adaptation (23 percent). The percent of assistive technology devices paid for solely out-of-pocket increased with age, but the percent of home accessibility features paid for solely out-of-pocket did not change with age.

Unmet need

Near the end of the Assistive Devices interview, respondents were asked, "Does anyone in the family NEED any special equipment that they DON'T HAVE?" If so, they were asked who that family member was, what equipment they needed, and why they did not have it. Persons identified by respondents in answers to these questions are considered to have an unmet need for assistive technology devices. (Home accessibility features were not included in these questions.) It should be noted that "unmet need" and the "met need" it implies are defined in terms of the perceptions of a household respondent. A health professional might reach a different conclusion in individual cases.

The percent distributions of persons reported to have an unmet need for assistive technology devices by the reason that they do not have it, according to age, are shown in table 6. More than 2.5 million persons, or about 1 percent of the population, have an unmet need for assistive technology devices. About 1.2 million persons of working age (25–64 years) have an unmet need for assistive technology devices.

Overall and in every age group shown, the reason most often given for not having a needed assistive technology device is financial—people could not afford to buy it. Overall, three-fifths said they could not afford the needed assistive technology devices, with the figure being highest (70 percent) in the population aged 25–44 years.

Poverty and assistive technology devices

People whose family incomes are below the poverty line are somewhat more likely to use assistive technology devices than those whose incomes are above the poverty line (5.6 percent and 5.0 percent, respectively). More than half of poor people with assistive technology devices had the help of a third-party payer in obtaining devices, compared to about one-third of nonpoor users. Poor people were about twice as likely as nonpoor people to say they needed a device they did not have (1.9 percent and 1.0 percent, respectively).

Trends in prevalence of assistive technology devices

The 1980 National Health Interview Survey collected data on some assistive technology devices in a

manner comparable with that used in 1990. For those technologies, the prevalence in 1990 and 1980 and the percent change over the decade are shown in table 7. Also shown are the age-adjusted estimates of prevalence for 1990, using the 1980 population as the standard, and the percent differences between those estimates and the 1980 estimates. The age-adjusted 1990 estimates can be considered the numbers expected if the age composition of the population had not changed between 1980 and 1990.

The total population increased by about 13 percent between 1980 and 1990, but use of the selected assistive technology devices increased more rapidly. Use of anatomical braces more than doubled, and use of walkers and wheelchairs nearly doubled. The numbers of users of canes and artificial limbs also increased more rapidly than the general population. Only the use of crutches, many of which, as previously noted, are used only temporarily during recovery from injuries, increased at about the same rate as the population.

Because the population aged between 1980 and 1990, and because older people are more likely than younger people to use assistive technology devices, some of the increase in the prevalence of devices can be attributed to the aging of the population. However, comparing the 1980 prevalence estimates with the 1990 age-adjusted estimates controls statistically for the aging of the population and reveals the change in prevalence net of aging. The last column of table 7 shows the percent difference between the 1980 estimates and the 1990 age-adjusted estimates. For each type of device, the age-adjusted percent difference is less than the unadjusted percent difference, indicating that the aging of the population did indeed account for a significant part of the overall increase in use of devices. However, with the exception of artificial limbs and crutches, the age-adjusted differences are greater than the 13 percent growth in population, indicating that, even allowing for the aging of the population, use of assistive technology devices grew more rapidly than the population during the decade.

Discussion

The data presented here show that finances are a barrier to acquiring assistive technology. For noninstitutionalized persons, assistive technology devices and accessibility features in homes are often paid for by individuals and families out-of-pocket rather than with contributions from other parties. Reliance on payment by individuals and their families reduces access to assistive technology for persons in poverty. Although the rate of people using assistive technology devices is slightly higher among persons in poverty than among those not in poverty, poor people express more need for these devices. Persons in poverty are twice as likely as persons not in poverty to have an unmet need for assistive technology devices mainly because they cannot afford to buy them. Medicaid, Medicare, Veterans' Administration, and other public programs help people in poverty and those over 65 to acquire assistive technology devices, but a third or more are purchased by poor individuals and their families without contributions from other parties. These programs seldom pay for accessibility features in homes, which are most often paid for by individuals and families. The survey did not ask about unmet needs for home accessibility features.

Despite financial problems in acquiring assistive technology devices, use of devices has increased dramatically over the past decade. The number of users of wheelchairs and walkers almost doubled from 1980 to 1990, and the number of users of leg, foot, and other braces has more than doubled. These increases may be due to improved coverage by public programs, reduced costs of technology, and improved design, which has made devices lighter, safer, stronger, easier to use, and more attractive. The aging of the population has contributed to the increased number of mobility devices, but orthoses tend to be used more by the younger population.

Nevertheless, considerable unmet demand for assistive technology remains: Some 2.5 million persons in 1990 stated they needed technology devices they did not have. Some of them need an enhanced version of a device they already have, and others need a device they do not have at all. The main reason given for this unmet need is inability to pay for it out-of-pocket and it is not covered by health insurance or programs in which they are enrolled.

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Table 1. Number of persons using assistive technology devices or living in homes with accessibility features, by type of device or feature and age of person: United States, 1990

Assistive technology device and home accessibility feature	*All ages*	*24 years and under*	*25–44 years*	*45–64 years*	*65–74 years*	*75 years and over*
Assistive technology device			Number in thousands			
Any assistive technology device	13,128	1,048	2,228	3,022	2,756	4,073
Anatomical technology devices:						
Any anatomical technology device	3,732	646	1,367	1,052	388	277
Leg brace	862	208	288	208	97	61
Foot brace	186	71	44	*30	*29	*12
Arm brace	210	*28	87	62	*20	*13
Hand brace	208	*28	93	63	*22	*4
Neck brace	299	*27	118	109	*27	*18
Back brace	1,173	68	420	460	128	98
Other brace	849	241	369	146	46	48
Artificial leg or foot	184	*8	*28	64	47	*38
Artificial arm or hand	*34	*12	*4	*8	*7	*2
Mobility technology devices:						
Any mobility technology device	6,403	240	609	1,385	1,435	2,735
Crutch	671	87	173	210	137	64
Cane or walking stick	4,400	*31	319	1,011	1,032	2,007
Walker	1,687	*34	72	276	350	957
Wheelchair	1,411	139	168	304	324	476
Scooter	64	*6	*11	*18	*18	*11
Other mobility technology	254	*18	*28	66	57	85
Hearing technology devices:						
Any hearing technology device	3,987	152	257	818	1,142	1,618
Hearing aid	3,782	148	228	743	1,102	1,562
TDD/TTY	173	*22	*23	56	*24	*48
Special alarm	76	*7	*17	*24	*5	*23
Other hearing technology	564	*24	56	136	142	205
Vision technology devices:						
Any vision technology device	261	*12	67	*39	*32	111
White cane	109	*2	43	*17	*14	*32
Other vision technology	177	*10	*34	*24	*26	82
Speech technology devices:						
Any speech technology device	*34	*8	*2	*4	*8	*11
Other types of technology devices:						
Any other type of technology device	1,331	156	277	333	296	269
Adapted typewriter or computer	48	*12	*24	*8	*0	*4
Adapted automobile	211	*19	71	60	51	*11
Other technology device	1,138	140	196	289	257	257
Home accessibility feature						
Any type of home accessibility feature	7,102	1,395	1,272	1,484	1,284	1,667
Ramps	2,109	578	457	486	321	267
Extra-wide doors	1,651	397	333	410	249	263
Elevator or stair lift	409	66	*28	45	97	173
Hand rails	3,396	425	420	686	778	1,086
Raised toilet	1,324	125	133	285	276	505
Adapted door locks	410	57	*29	90	86	148
Lowered counters	242	52	47	59	*22	62
Slip-resistant floors	212	*40	41	79	*25	*27
Other home accessibility feature	1,595	313	313	345	293	330

NOTES: Numbers do not add to totals because categories are not mutually exclusive; that is, a single person in the total may be counted in more than one type of device category. A TTD/TTY is a typewriter-like device for the deaf that communicates over telephone lines using text.

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Table 2. Percent distribution of persons using assistive technology devices or living in homes with accessibility features by age of person, according to type of device or feature: United States, 1990

Assistive technology device or home accessibility feature	*All ages*	*24 years and under*	*25–44 years*	*45–64 years*	*65–74 years*	*75 years and over*
Assistive technology device			Percent distribution			
Any assistive technology device	100.0	8.0	17.0	23.0	21.0	31.0
Anatomical technology devices:						
Any anatomical technology device	100.0	17.3	36.6	28.2	10.4	7.4
Leg brace	100.0	24.2	33.4	24.2	11.2	7.0
Foot brace	100.0	38.4	23.8	16.1	15.6	*6.5
Arm brace	100.0	13.4	41.4	29.4	9.5	*6.2
Hand brace	100.0	13.4	44.6	30.0	10.6	*1.9
Neck brace	100.0	9.0	39.6	36.5	9.0	*6.0
Back brace	100.0	5.8	35.8	39.2	10.9	8.3
Other brace	100.0	28.4	43.5	17.1	5.4	5.7
Artificial leg or foot	100.0	*4.3	15.2	34.6	25.5	20.6
Artificial arm or hand	100.0	*35.3	*11.8	*23.5	*20.6	*5.9
Mobility technology devices:						
Any mobility technology device	100.0	3.7	9.5	21.6	22.4	42.7
Crutch	100.0	13.0	25.8	31.3	20.4	9.6
Cane or walking stick	100.0	0.7	7.2	23.0	23.5	45.6
Walker	100.0	2.0	4.3	16.3	20.7	56.7
Wheelchair	100.0	9.9	11.9	21.5	22.9	33.8
Scooter	100.0	*9.4	*17.3	28.3	28.3	*17.3
Other mobility technology	100.0	*7.1	11.0	26.0	22.3	33.5
Hearing technology devices:						
Any hearing technology device	100.0	3.8	6.4	20.5	28.6	40.6
Hearing aid	100.0	3.9	6.0	19.6	29.1	41.3
TDD/TTY	100.0	12.7	13.3	32.1	13.8	27.5
Special alarm	100.0	*9.2	22.3	31.5	*6.6	30.2
Other hearing technology	100.0	4.3	10.0	24.2	25.2	36.4
Vision technology devices:						
Any vision technology device	100.0	*4.6	25.8	15.0	12.3	42.4
White cane	100.0	*1.8	39.9	15.6	*12.9	29.4
Other vision technology	100.0	*5.6	19.2	13.5	14.7	46.3
Speech technology devices:						
Any speech technology device	100.0	*23.5	*5.9	*11.8	*23.5	*32.4
Other types of technology devices:						
Any other type of technology device	100.0	11.7	20.8	25.0	22.2	20.2
Adapted typewriter or computer	100.0	*25.0	50.0	*16.7	*0.0	*8.3
Adapted automobile	100.0	9.0	33.6	28.3	24.3	*5.2
Other technoloigy device	100.0	12.3	17.2	25.4	22.6	22.6
Home accessibility feature						
Any type of home accessibility feature	100.0	19.6	17.9	20.9	18.1	23.5
Ramps	100.0	27.4	21.7	23.1	15.2	12.6
Extra-wide doors	100.0	24.0	20.2	24.8	15.1	15.9
Elevator or stair lift	100.0	16.0	6.9	11.0	23.8	42.2
Hand rails	100.0	12.5	12.4	20.2	22.9	32.0
Raised toilet	100.0	9.5	10.1	21.5	20.8	38.1
Adapted door locks	100.0	13.9	7.0	22.0	21.0	36.1
Lowered counters	100.0	21.4	19.3	24.4	9.1	25.7
Slip-resistant floors	100.0	18.9	19.4	37.2	11.8	12.7
Other home accessibility feature	100.0	19.6	19.6	21.7	18.4	20.7

NOTES: Sums may not equal totals due to rounding. A TTD/TTY is a typewriter-like device for the deaf that communicates over telephone lines using text.

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Table 3. Percent of persons using assistive technology devices, by type of technology device and age of person, and percent of persons living in homes with accessibility features, by type of accessibility feature, according to age: United States, 1990

Assistive technology device and home accessibility feature	*All ages*	*24 years and under*	*25–44 years*	*45–64 years*	*65–74 years*	*75 years and over*
Assistive technology device			Percent			
Anatomical technology devices:						
Any anatomical technology device	28.4	61.7	61.4	34.8	14.1	6.8
Leg brace	6.6	19.9	12.9	6.9	3.5	1.5
Foot brace	1.4	6.8	2.0	1.0	1.1	*0.3
Arm brace	1.6	2.7	3.9	2.0	0.7	*0.3
Hand brace	1.6	2.7	4.2	2.1	0.8	*0.1
Neck brace	2.3	2.6	5.3	3.5	1.0	*0.4
Back brace	8.9	6.5	18.8	15.2	4.6	2.4
Other brace	6.5	23.0	16.6	4.8	1.7	1.2
Artificial leg or foot	1.4	*0.8	1.3	2.1	1.7	0.9
Artificial arm or hand	0.3	1.1	*0.2	*0.3	*0.3	*0.0
Mobility technology devices:						
Any mobility technology device	48.8	22.9	27.3	45.8	52.1	67.2
Crutch	5.1	8.3	7.8	6.9	5.0	1.6
Cane or walking stick	33.5	3.0	14.3	33.5	37.4	49.3
Walker	12.9	3.2	3.2	9.1	12.7	23.5
Wheelchair	10.8	13.3	7.6	10.0	11.8	11.7
Scooter	0.5	*0.6	*0.5	*0.6	*0.7	*0.3
Other mobility technology	1.9	*1.7	1.3	2.2	2.1	2.1
Hearing technology devices:						
Any hearing technology device	30.4	14.5	11.5	27.1	41.4	39.7
Hearing aid	28.8	14.1	10.2	24.6	40.0	38.3
TDD/TTY	1.3	2.1	1.0	1.8	0.9	1.2
Special alarm	0.6	*0.7	*0.8	0.8	*0.2	0.6
Other hearing technology	4.3	2.3	2.5	4.5	5.1	5.0
Vision technology devices:						
Any vision technology device	2.0	*1.1	3.0	1.3	1.2	2.7
White cane	0.8	*0.2	1.9	*0.6	*0.5	0.8
Other vision technology	1.3	*1.0	1.5	0.8	0.9	2.0
Speech technology devices:						
Any speech technology device	0.3	*0.8	*0.1	*0.1	*0.3	*0.3
Other types of technology devices:						
Any other type of technology device	10.1	14.9	12.4	11.0	10.7	6.6
Adapted typewriter or computer	0.4	*1.1	1.1	*0.3	*0.0	*0.1
Adapted automobile	1.6	*1.8	3.2	2.0	1.9	*0.3
Other technololgy device	8.7	13.4	8.8	9.5	9.3	6.3
Home accessibility feature						
Ramps	29.7	41.4	36.0	32.8	25.0	16.0
Extra-wide doors	23.2	28.5	26.2	27.6	19.4	15.8
Elevator or stair lift	5.8	4.7	2.2	3.0	7.6	10.4
Hand rails	47.8	30.5	33.0	46.2	60.6	65.2
Raised toilet	18.6	9.0	10.5	19.2	21.5	30.3
Adapted door locks	5.8	4.1	2.3	6.1	6.7	8.9
Lowered counters	3.4	3.7	3.7	4.0	1.7	3.7
Slip-resistant floors	3.0	2.9	3.2	5.3	1.9	1.6
Other home accessibility feature	22.5	22.4	24.6	23.3	22.8	19.8

NOTE: A TTD/TTY is a typewriter-like device for the deaf that communicates over telephone lines using text.

Table 4. Percent of persons who use assistive technology devices or live in homes with accessibility features, by age of person and by technology or accessibility feature: United States, 1990

Assistive technology device or home accessibility feature	*All ages*	*24 years and under*	*25–44 years*	*45–64 years*	*65–74 years*	*75 years and over*
			Percent of total population			
Any assistive technology device	5.3	*1.2	2.8	6.5	15.2	34.9
Any anatomical technology device	1.5	*0.7	1.7	2.3	2.1	2.4
Any moblity technology device	2.6	*0.3	*0.8	3.0	7.9	23.4
Any hearing technology device	1.6	*0.2	*0.3	1.8	6.3	13.8
Any vision technology device	*0.1	*0.0	*0.1	*0.1	*0.2	0.9
Any speech technology device	*0.0	*0.0	*0.0	*0.0	*0.0	*0.1
Any other type of technology device	0.5	*0.2	*0.3	0.7	1.6	2.3
Any type of home accessibility feature	2.9	*1.6	1.6	3.2	7.1	14.3

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Table 5. Number of persons with assistive technology devices or home accessibility features and percent distribution by source of payment, according to age of person: United States, 1990

Source of payment	All ages	24 years and under	25–44 years	45–64 years	65–74 years	75 years and over
Assistive technology devices			Number in thousands			
Persons with assistive technology device	13,128	1,048	2,228	3,022	2,756	4,073
			Percent distribution			
All sources of payment[1]	100.0	100.0	100.0	100.0	100.0	100.0
Out-of-pocket	48.2	34.0	37.5	45.5	52.5	56.0
Third party[2]	34.0	45.0	49.2	37.1	28.7	24.8
Combination of out-of-pocket and third party	17.9	21.0	13.3	17.4	18.7	19.2
Home accessibility features			Number in thousands			
Persons with home accessibility features	7,102	1,395	1,272	1,484	1,284	1,667
			Percent distribution			
All sources of payment[1]	100.0	100.0	100.0	100.0	100.0	100.0
Out-of-pocket	77.5	76.1	77.9	74.6	81.6	78.1
Third party[2]	15.2	17.9	15.4	16.1	11.7	15.0
Combination of out-of-pocket and third party	7.3	6.0	6.7	9.3	6.8	6.9

[1]Excludes persons whose device or feature was not paid for.
[2]Includes persons who did not know the source of payment.
NOTE: Sums may not equal totals due to rounding.

Table 6. Number of persons who need assistive technology devices they do not have and percent distribution by reason for not having them, according to age of person: United States, 1990

Reason for not having assistive technology devices	All ages	24 years and under	25–44 years	45–64 years	65–74 years	75 years and over
			Number in thousands			
Persons with unmmet need for assistive technology devices[1]	2,508	178	448	760	567	556
			Percent distribution			
All reasons[1]	100.0	100.0	100.0	100.0	100.0	100.0
Cannot afford	61.1	59.7	69.6	63.2	61.6	51.6
All other reasons[1]	38.9	40.3	30.4	36.8	38.4	48.4

[1]Includes persons for whom the reason is unknown.

Table 7. Number of persons in the population, number of persons using selected assistive technology devices and percent change from 1980 to 1990, and age-adjusted number using assistive technology devices and percent difference between 1980 and 1990: United States, 1980 and 1990

Assistive technology device	1980	1990	Change from 1980 to 1990	1990	Difference between 1980 and age-adjusted 1990
	Number in thousands		Percent	Age-adjusted number in thousands[1]	Percent
All persons	217,923	246,099	12.9	246,099	12.9
Leg or foot brace	472	1,048	121.9	924	95.8
Brace other than leg or foot	1,000	2,740	174.1	2,436	143.6
Artificial limb	177	218	23.2	189	6.8
Crutch	588	671	14.2	590	0.3
Cane or walking stick	2,878	4,400	52.9	3,626	26.0
Walker	866	1,687	94.8	1,363	57.4
Wheelchair	720	1,411	96.1	1,185	64.6

[1]Age-adjusted by the direct method, using the 1980 population as standard, and age groups under 45 years, 45–64 years, 65–74 years, and 75 years and over.

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Symbols	
- - -	Data not available
. . .	Category not applicable
-	Quantity zero
0.0	Quantity more than zero but less than 0.05
Z	Quantity more than zero but less than 500 where numbers are rounded to thousands
*	Figure does not meet standard of reliability or precision

Technical notes

The statistics in this report are based on information collected by the National Health Interview Survey, a data system of the National Center for Health Statistics (NCHS). The information was collected by personal interview in the homes of a nationally representative sample of nonmilitary persons living in households.

The interviewers were recruited, trained, and supervised by the Bureau of the Census under terms of an interagency agreement with NCHS. The interview data were keyed and edited by NCHS.

In the 1990 NHIS, interviews were conducted in 46,476 households, or 95 percent of the eligible households. Nearly 120,000 persons lived in the households in which interviews were conducted. Of these persons, 6,310 were reported to use assistive technology devices, and 3,239 were reported to have home accessibility features. The sample cases were weighted to make the estimates of national statistics shown in this report. The weight for each case adjusted for several factors, including the nonresponse of some eligible households.

Although extensive quality control measures are used at each stage of the NHIS, both sampling and nonsampling errors are present in the estimates. Sampling errors arise because the information comes from a sample of the population, not from the whole population. Estimates based on a sample often differ from statistics based on a complete enumeration. That difference, the "sampling error," can be measured by a statistic called the "standard error." Standard errors were estimated using the following formula:

$$SE(x) = \sqrt{\frac{1783x\,(100-x)}{y}}$$

where x is the estimated percent, y is the base (denominator) of the percent, and $SE(x)$ is the standard error of the percent. This formula was derived by estimating the standard errors of a set of selected statistics using Taylor linearization (a precise technique), then mathematically fitting a curve to the relationship between the estimates and their standard errors. The formula described the curve. Estimates of statistics that have a standard error that is 30 percent or more of the estimate itself are considered unreliable and are marked with an asterisk.

Sampling error also affects comparisons of estimates: If estimates have large sampling errors, a difference between them may have arisen by chance. Statements about differences among estimates have been tested (using a two-tailed t-test) and found to have been unlikely to have occurred by chance (probability less than 0.05).

Nonsampling errors can arise from a variety of sources, and are difficult to measure. In most surveys, the most serious source of nonsampling error is inaccurate information given by the respondent, who may misunderstand the question, not remember the correct answer, or willfully give a false answer. Other sources of nonresponse error are mistakes in asking questions or recording answers, and mistakes in coding and keying interview data.

For more information on sampling design, field procedures, data processing, estimation procedures, and variance estimation, see *Current Estimates from the National Health Interview Survey, 1990*, which also includes reproductions of the Assistive Devices questionnaire and other questionnaires used in 1990 (4).

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